TM 9-1220-204-14

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS FOR INDIRECT

FIRE PLOTTING BOARD M16 W/E

(1220-602-7941)

HEADQUARTERS, DEPARTMENT OF THE ARMY
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HEADQUARTERS,
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OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS

INDIRECT FIRE, PLOTTING BOARD M16 W/E (1220-602-7941)

*This manual supersedes TM 9-1220-204-15 dated 26 July 1962, including all changes.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1–1. Scope

a. This manual contains instructions for operator, organizational, direct support, general support, and depot maintenance for Indirect fire plotting board M16 W/E (1220–602–7941).

b. Appendix A is a list of current references, including supply and technical manuals, forms and other publications applicable to plotting board M16.

c. Appendix B contains a maintenance allocation chart which lists maintenance responsibilities allocated to each category of maintenance.

d. Appendix C contains basic issue items, organizational, direct support, general support, and depot maintenance repair parts and special tools list.

1–2. Forms, Records and Reports

a. Authorized Forms. Refer to TM 38–750. For listing of all forms refer to DA Pam 310–2.

b. Report of Accidents. The necessary reports are prescribed in AR 385–40.

1–3. Reporting of Errors

Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to the Commanding Officer, Frankford Arsenal, ATTN: AMSWE–MAF–W3100, Philadelphia, Pa. 19137.

Section II. DESCRIPTION AND DATA

1–4. Description

a. General. Plotting board M16 (fig. 1–1) is a portable instrument used with the 81-mm mortar M29 to compute the range and azimuth of a target for indirect firing of the weapon. The plotting board utilizes known range and azimuth data from the weapon to an observation post, in combination with reported data received from the post concerning location of the target with respect to the post. It is used to compute geometrically the range and azimuth of the target from the weapon.

b. Basic Components. Plotting board M16 (fig. 1–2) is a three-part assembly consisting of a base grid (1), azimuth disk (2), and range scale arm (3).

(1) *Base Grid.* The base grid (fig. 1–3) is a white plastic translucent sheet securely bonded to a thin, flat magnesium-alloy base upon which the azimuth disk is centrally mounted on the pivot point (4) and may be rotated. In addition to the name and model number, the base grid contains those markings on its under surface described in (a) through (d) below, which are printed or engraved in black, unless otherwise stated. The upper surface of the base grid is roughened slightly, as the azimuth disk is roughened, to receive pencil markings during fire problem computation. The base grid contains a 20.160-inch circle surrounding a grid pattern (6) formed by 127 equally spaced horizontal lines which are intersected by 127 equally spaced vertical lines. The circle and all markings contained within the circle are green. The intersecting lines within the circle form a pattern of squares, each square representing range of 50 meters square, based upon a ratio of 1:12,500 meters. The centerlines of the grid pattern and every tenth line beyond these centerlines are heavier than the others, so a pattern of 500-meter squares is outstanding. In addition to the pattern

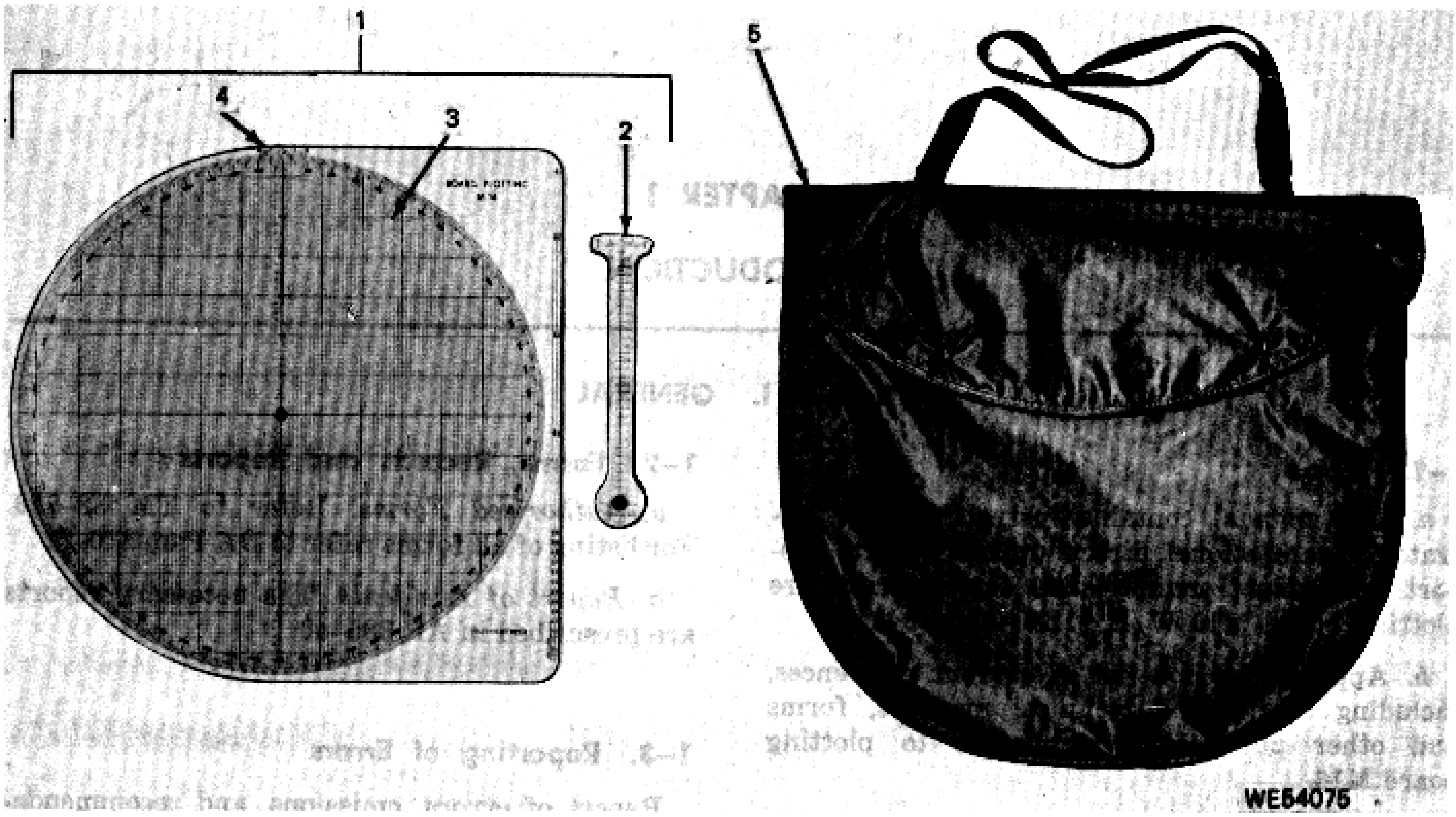


Figure 1-1. Indirect fire, plotting board M16 W/E

of squares, the base grid contains those markings which help to establish correct ranges rapidly during use of the plotting board.

Note: Later models of the base have been fabricated utilizing aluminum-alloy in lieu of magnesium-alloy. The aluminum-alloy base has been welded to the center of the base grid to reinforce the pivot point for mounting of the azimuth disk and range scale arm. A beaded metal edge has been incorporated in the new design to help secure the base grid to aluminum-alloy base.

(a) The heavy horizontal lines of the base grid pattern (6) are numbered from 0 to 6000 in increments of 500, starting with the lower heavy line which is the 0 line. This series of numbers is located between the first and second heavy vertical lines to the left of the vertical centerline (3).

(b) A second and third series of numbers identify every second horizontal graduation from 1 to 31, each number representing 100 meters of range from the center. One series of these numbers run progressively higher from the center of the base grid to the circle's periphery in the upper half of the grid pattern, and the second series run progressively higher from the center of the circle's periphery in the lower half of the base grid. The 5, 10, 15, 20, 25, and 30 portions of these series that fall upon the heavy horizontal lines are printed to show the full range value at these locations; i.e., 500, 1000, 1500, 2000, 2500, and 3000, and are located directly on the centerline of the circle. The other numbers of both series are located just to the left of the vertical centerline and their position on this line is identified with a short heavy horizontal dash, centrally located on the vertical line, and superimposed on the equivalent light horizontal line.

(c) The letters O.P. are located on the horizontal centerline (5) of the grid pattern to the right of the vertical centerline. These letters represent the observation post (center of the plotting board).

(d) The arrowhead (2) located at the top of the vertical centerline is used as an index during operation of vernier scale and the azimuth disk.

(e) A vernier scale (1) centrally locating the index on the base grid is provided to obtain more accurate azimuth readings during operations involving use of the azimuth disk. The vernier scale is graduated into 20 equal spaces and is numbered from 0 to 10 in increments of 5, outward from the center to either end. The numeral 0 and all graduations, except the center

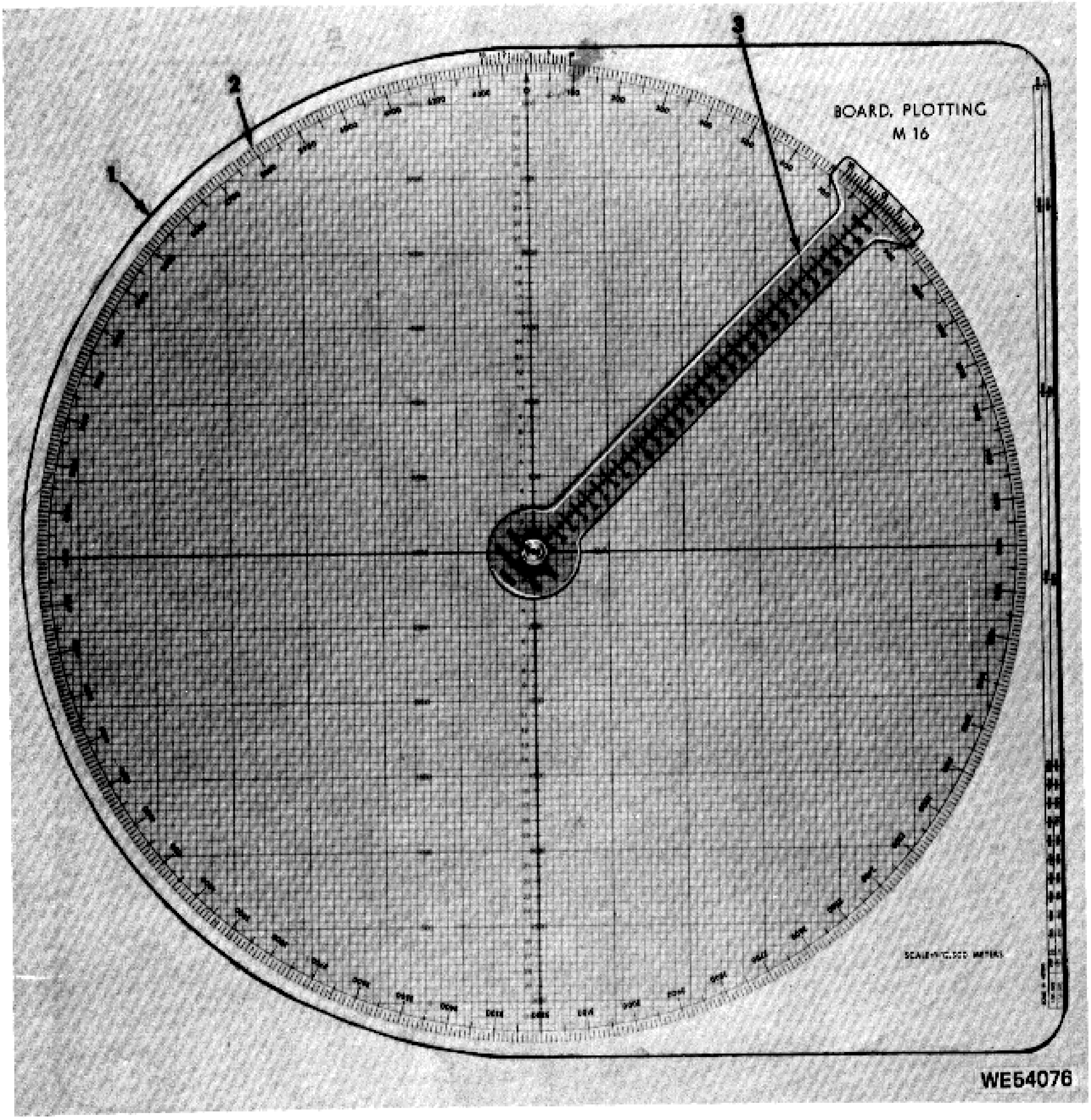


Figure 1-2. Indirect fire, plotting board M16 W/E

graduation, are colored red on early production models. On present production models, they are colored green. The center graduation (0 graduation) of all other numbers are colored black on all models.

(f) Rising vertically along the right edge of the base grid is a double scale (7) computed in meters, which is used to make and/or obtain measurements within the grid pattern. The upper portion of this double scale is based on the ratio of 1:50,000 and the lower portion is based on 1:25,000. The legend for these scales is located to the left of the scales. An explanatory note stating that the scale is computed in meters is located directly above.

(g) Near the lower corner of the base grid, to the left of the double scale, is the grid legend explaining that the base grid pattern is based upon a ratio of 1:12,500 meters.

(2) *Azimuth Disk.* The azimuth disk (fig. 1-4) is a translucent plastic sheet which is securely attached to a pivot point (1) and is mounted to the base grid upon which it may be rotated as required. The disk is graduated in black on its under surface into 640 divisions which are equally spaced around its outer cir-

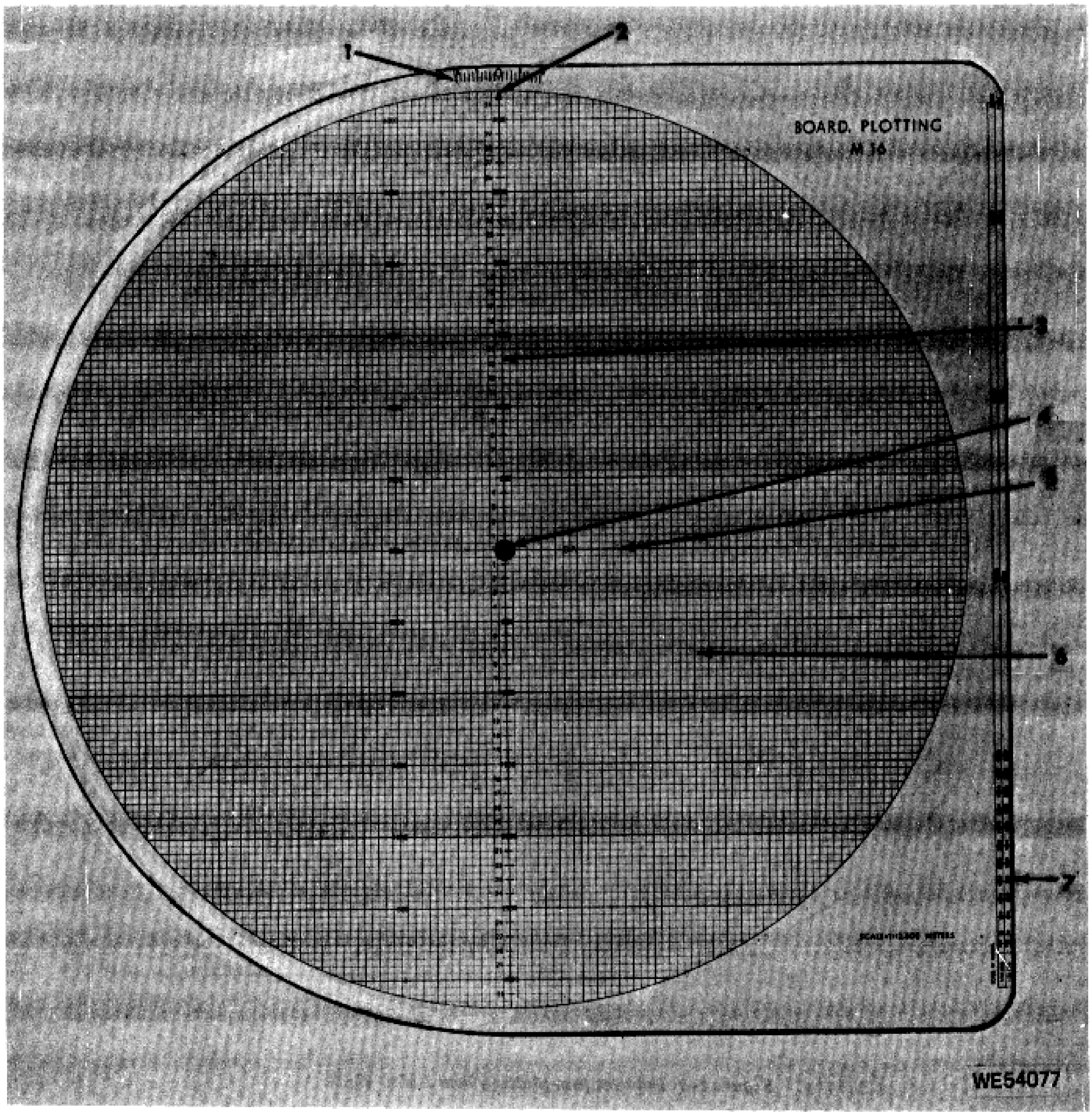


Figure 1–3. Base grid.

cumference. These graduations increase in value in a clockwise direction. Every tenth graduation represents 100 mils of azimuth. These extended graduations are numbered from 0 to 6300 around the full disk. A vernier scale (1)(e) above is provided on the base grid against which the azimuth scale (2) of the azimuth disk may be read. Two black index lines (3), dividing the disk into quadrants, are extended between the 0 and 3200-mil graduations and between the 1600 and 4800-mil graduations. The upper surface of the disk is roughened slightly to receive pencil marks during computation of a firing problem. These pencil marks may be erased after completion of the problem. The range scale arm is mounted on the top surface of the disk.

(3) *Range Scale Arm.* The range scale (fig. 1–5), a transparent plastic device, has a central knob (4) with a pivot pin (6) securely attached. The arm, which is easily removed, can be rotated as required upon its pivot point, within the central bore of the azimuth disk. The arm con-

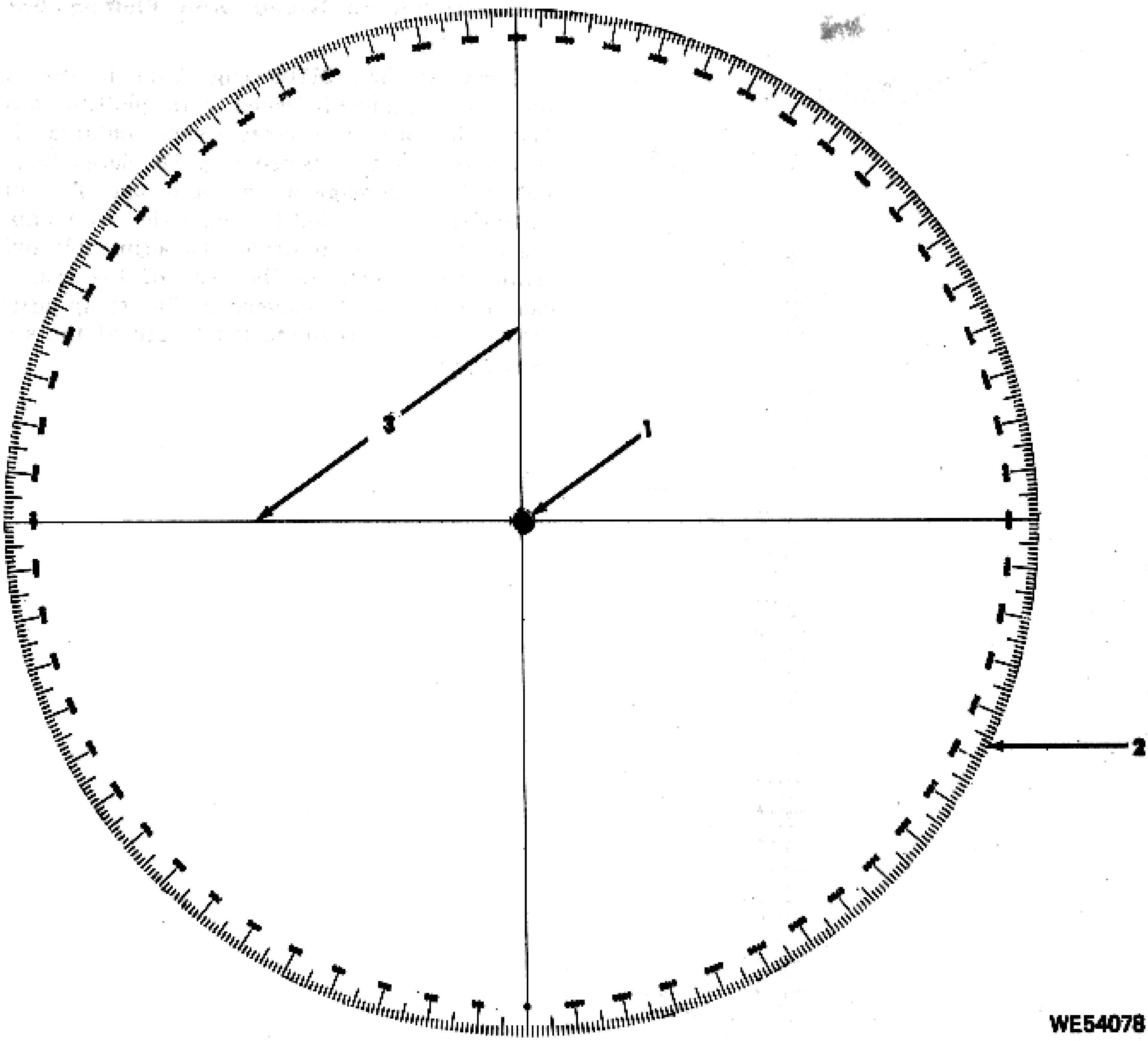


Figure 1–4. Azimuth disk.

tains a vernier scale (1), a range scale (2), and removal instructions (5), all printed or engraved in black on its under surface.

(a) The vernier scale (1), located along the outer edge of the arm, is provided to obtain more accurate azimuth readings along that azimuth being plotted with the arm. The vernier scale is divided into 20 equal spaces and is numbered from 0 to 10 in increments of 5, outward from the center to either end.

(b) The range scale (2) runs lengthwise along the center of the arm. The scale is graduated in 50-meter increments from 100 to 3200 meters of range and is numbered in sequence from 1 to 31. These numbers (1 to 31) are located to the right of the centerline (3) on the arm. They represent ranges of 100 to 3100 meters from the center, and their locations are coincident with similar locations on the base grid pattern. This scale is used to obtain rapid ranges along any azimuth during plotting of the firing problem.

1–5. Tabulated Data

a. Weight and Dimensions.

Weight	3 pounds, 13 ounces
Length	22 inches
Width	21½ inches
Thickness	⅞ inch

b. Limits of Operation.

Azimuth	0 to 6400 mils (unlimited)
Range	Unlimited

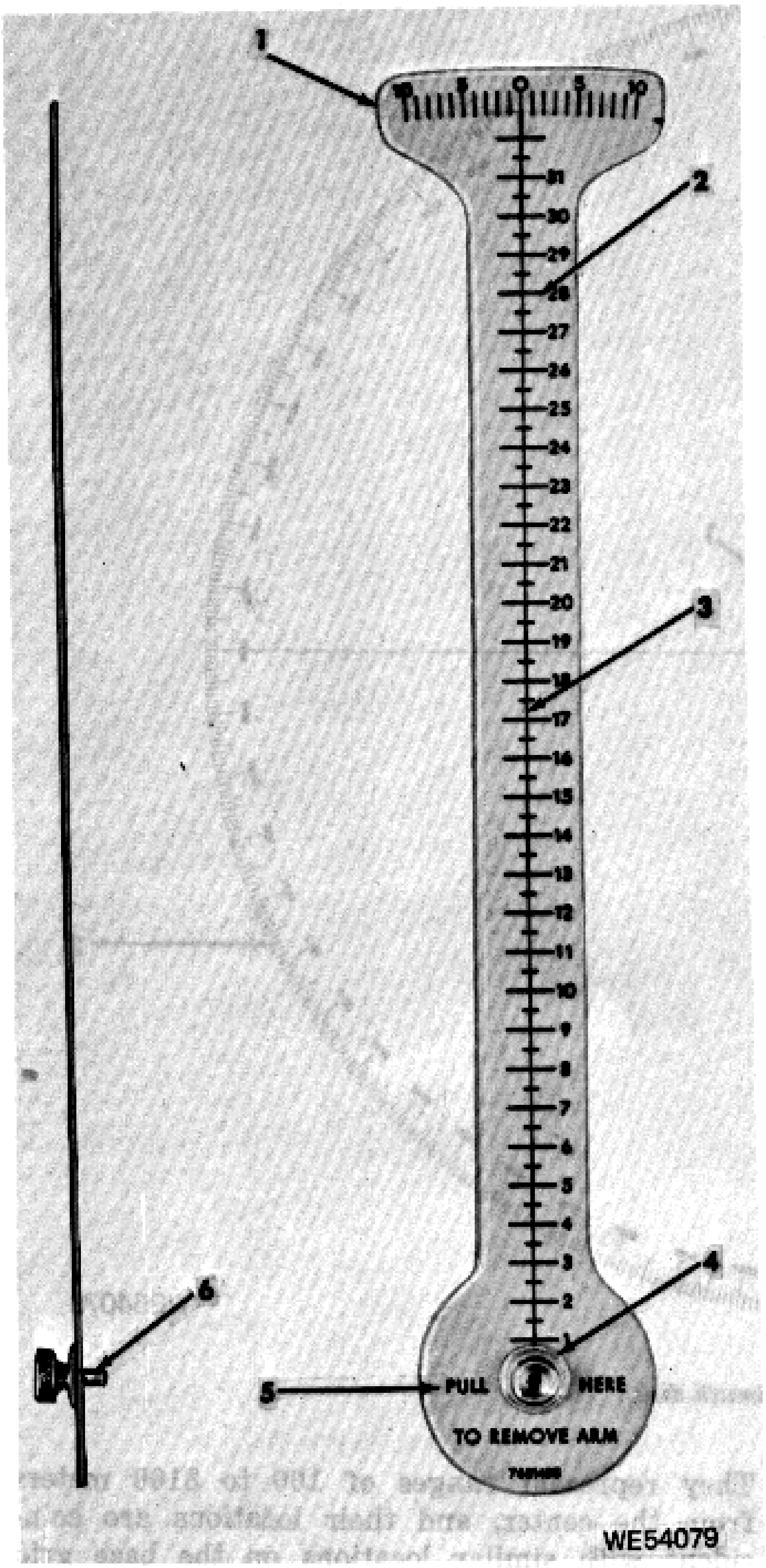


Figure 1–5. Range scale arm.

1–6. Equipment Issued with Plotting Board M16

Carrying Case M105 (fig. 1–1) is the only piece of equipment issued with plotting board M16. The case is a large nylon container into which the plotting board may be placed to protect it from damage when not in use. Two snap fasteners are provided to secure the cover flap of the case in closed position. An adjustable nylon strap is connected to the rear of the case for easy portability or suspension. The strap adjustment is used to regulate the length of the strap as required.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2–1. General

a. When a new, used, or reconditioned plotting board M16 is first received by the using organization, it is the responsibility of the officer-in-charge to determine whether the materiel has been properly prepared for service by the supplying organization and to be sure that it is in condition to perform its function.

b. Make a record of missing parts or equipment and malfunctions. Correct all deficiencies which can be corrected.

2–2. Duties

The organizational mechanic performs the inspection to determine whether the materiel has been properly prepared for service and is in condition to perform its assigned mission. It is the duty of the operator to assist the organizational mechanic in the performance of these services.

2–3. Services

Upon receipt of materiel, the operations described in *a* through *k* below will be performed to place the plotting board into operating condition.

a. Open the sealed package and remove the contents consisting of plotting board M16, TM 9–1220–204–14, and carrying case M105.

b. Open two snap fasteners securing the carrying case M105 (fig. 1–1) in closed position, and remove the bagged plotting board M16 and TM 9–1220–204–14 from the carrying case.

c. Open the sealed bag and remove technical manual and prepackaged plotting board M16.

d. Remove tape securing sandwiched azimuth disk and range scale arm in position on base grid.

e. Remove fiberboard pad from azimuth disk and range scale arm.

Note: Apply equal pressure under opposite edges of the azimuth disk and lift it from surface of base grid.

f. If temperatures are above freezing (32° F), use cloth slightly dampened with water and remove all dust and dirt from the surface of the base grid (fig. 1–3) and from all surfaces of the azimuth disk (fig. 1–4) and range scale arm (fig. 1–5). If temperatures are below freezing, use a clean dry cloth.

g. Clean the pivot points of the base grid, azimuth disk, and range scale arm. Wipe these metal surfaces with a lightly oiled rag. Apply a very light film of aircraft and instrument grease MIL–G–23827.

h. Invert carrying case M105 and shake out all dust and dirt adhering to its internal surfaces.

i. Place pivot points of the base grid (fig. 1–3) and azimuth disk (fig. 1–4) together. Apply slight pressure on the azimuth disk pivot point and press down until the azimuth disk is secured in base grid bearing.

j. Secure the pivot point of the range scale arm (fig. 1–5) into the pivot point of the azimuth disk (fig. 1–4).

k. Insert the plotting board M16 into carrying case M105, and secure the cover flap of the case in a closed position with the two snap fasteners. Place the carrying case with installed plotting board in stowed position.

Note. Stow TM 9–1220–204–14 inside carrying case M105 with plotting board M16 when not in use.

2–4. General

This section contains instructions for the proper care of the materiel, preparation for operation, and the operation of plotting board M16 under moderate temperatures and atmospheric conditions. Every organization equipped with this plotting board must thoroughly train its personnel in the procedures for its operation. For operation under unusual conditions, see paragraphs 2–11 through 2–13.

2–5. Care in Handling

Plotting board M16 will not stand rough handling or abuse. Inaccuracy or breakage will result from mistreatment. Any instrument that is functioning inaccurately or that contains damaged parts must be brought to the attention of organizational maintenance personnel for disposition. Repairs other than those expressly authorized will not be performed by the operator.

a. Keep the plotting board and carrying case as clean and dry as possible. If the board and/or case is wet, wipe dry, spread case open and allow to air-dry thoroughly. Do not place the plotting board in the direct rays of hot sun, on heated radiators, or on other types of heated equipment where damage to the base grid, azimuth disk, and/or range scale arm may occur.

b. When not in use, keep the plotting board within the carrying case so that it is protected from dirt, dust, moisture, chipping, scratching, and destruction.

c. Do not place the plotting board on its edge or store other equipment on the board. These actions will bend, break, and/or chip and render the board inoperable.

2–6. Preparation for Use

a. Setting UP.

(1) Remove carrying case M105 containing plotting board M16 from stowed position.

(2) Open the two snap fasteners securing the cover flap of the carrying case in closed position, open the flap, and remove the plotting board from the case.

(3) Place the plotting board on a flat stable surface and proceed to operate it.

b. Inspection.

(1) *General.* Whenever inaccuracies, maladjustments, or other conditions affecting serviceability are disclosed by the inspection prescribed in table 2–1, remedial action should be taken if the maintenance required is within the scope of the using organization. If the maintenance required is beyond the scope of the using organization, the condition should be referred to the organizational maintenance personnel for disposition in accordance with the maintenance allocation chart (app. B).

(2) *Procedure.* Examine the plotting board M16 and carrying case M105 for completeness and general appearance. There will be no rust and/or corrosion on any metal part. The plastic surfaces of the plotting board will not be cracked, chipped, warped, excessively scratched, pitted, or opaqued so that viewing of the grid pattern, scales and graduations is hindered. In addition, inspect the plotting board and carrying case as outlined in table 2–1.

Table 2–1. Operator's Inspection Chart for Plotting Board M16 and Carrying Case M105

Point of inspection	Figure No.	Acceptable standard
		PLOTTING BOARD M16
Range scale arm tight on azimuth disk	1–2 and 1–3	The base grid surface shall be clean, flat, and in good condition as explained in paragraph 2–5a through c.
Azimuth disk	1–2 and 1–4	The azimuth disk shall be clean, flat, and in good condition as explained in paragraph 2–5a through c.
Range scale arm	1–2 and 1–5	The range scale arm shall be clean, flat, and in good condition as explained in paragraph 2–5a through c. The range scale arm shall rotate freely on its central pivot point to any required azimuth position.

Table 2–1. Operator's Inspection Chart for Plotting Board M16 and Carrying Case M105—(Continued)

Point of inspection	Figure No.	Acceptable standard
Alinement	1–2	When the azimuth disk is rotated to aline the end of its 0 line with the 0 graduation of the base grid vernier scale, the end of the disk's 3200-mil azimuth line shall coincide with the bottom of the grid's vertical centerline. In the same position, the disk's 1600 to 4800 mil azimuth line shall be coincident throughout its entire length with the horizontal centerline of the grid. Alinement of the graduations on the range scale arm shall coincide with the graduations on the base grid surface when the arm is rotated on the surface of the azimuth disk.
Pivot points	1–3, 1–4 and 1–5	The pivot points in the base grid, azimuth disk, and range scale arm shall be clean, tight, not worn or bent, and shall be lubricated as specified in paragraph 2–3g.
		CARRYING CASE M105
Strap	1–1	Two strap holders attached to the back of carrying case M105, shall be securely fastened to the case with stitching and shall not be loose or torn. The strap, held at two ends in metal loops secured in the strap holders, shall be adjustable throughout its entire length.
Snaps	1–1	Two metal snaps shall be secured in the front portion of the carrying case M105, and the mating portion of the snaps shall be secured in the cover flap. The fabric surrounding the snaps shall be in good condition and the snaps shall hold the cover flap in a secure, closed position.

2–7. Operation

a. The theory of operation of the plotting board is simple and the accuracy of the results depends on the skill of the operator. The plotting board is used to plot accurately the relative positions of the weapons, base points and targets, and to determine the directions and distances between these points. The size of the dots placed on the plotting board affects the accuracy of the data determined. The dots will be made as small as possible. To make it easier to locate these small dots, a small circle may be placed around each dot. In computing the data, be careful to use the dot and not the circle. Pencils harder than 2H and gritty erasers should not be used on the translucent plotting surfaces.

b. An arbitrary point on the disk may be selected as the weapon position or the observation post. Whenever possible, the center (pivot point) of the plotting board is used to represent either the weapon position or the observation post.

c. To plot a point with a given azimuth and distance from another point, proceed as indicated in (1) through (3) below.

(1) Select an arbitrary point on the disk as location of the first point and place a pencil dot. (If the pivot point is selected as the arbitrary point, it is not necessary to make a pencil dot.)

(2) Rotate the azimuth disk on the base grid (fig. 1–2) until the stated azimuth is indicated over the index mark.

(3) To determine the distance on the plotting board from the first point to the second point, divide the stated distance by 50 or 100 (depending on which scale on the base grid pattern (fig. 1–3) is used). The result is the number of squares on the grid pattern between the two points. Count off the number of squares, or fractions of squares thus determined, from the first point toward the top of the plotting board and plot the second point. The second point may be plotted also by measuring off the stated distance from the first point toward the top of the plotting board using the range scales on the disk.

d. When the distance and azimuth from the observation post to the target and firing positions have been determined, the azimuth and range from the weapon position to the target position (WT-weapon to target) is determined as indicated in (1) through (4) below.

(1) Use the pivot point (figs. 1–3 and 1–4) as the observation post.

(2) The locations of the firing position and the target, as obtained at the observation post in terms of azimuth and distance, are plotted individually on the movable azimuth disk.

(a) Set the azimuth scale (fig. 1–4) graduation corresponding to the azimuth over the index mark (fig. 1–3).

(b) Mark each location with a pencil dot over the index line at the point on the range scale corresponding to the distance in meters. Each dot is plotted toward the top of the plotting board.

(3) To determine the azimuth between the two plotted points the operator must remember that all parallel lines have the same azimuth. Therefore, when a particular azimuth is rotated over the index mark, every vertical line on the grid pattern (fig. 1–3) is pointing along that same azimuth. This means also that the azimuth of any of the vertical lines of the grid pattern is read at the index mark. To find the azimuth of the target with respect to the firing position, rotate the azimuth disk (fig. 1–2) until the two pencil dots lie along one of the vertical lines on the base grid, or, until they are the same distance from the same vertical line with the target dot toward the top of the plotting board. The WT azimuth in this example may be read on the azimuth scale at the index mark on the base grid.

(4) Determine the range between the firing position and the target in meters by counting the number of small grid pattern graduations separating them when in the above position and multiplying this number by 50 or 100, depending on which scale on the grid pattern is used. The WT range can also be determined by measuring the distance, using one of the range scales on the base.

e. In many cases, the index mark does not fall exactly on one of the 10-mil graduation lines of the azimuth scale. When this occurs, the operator computing the range must use the vernier scale to read the azimuth to an accuracy of 1 mil (fig. 2–1). As an example, the use of the vernier scale for setting azimuth 5454 is shown in figure 2–1.

Note: Figure 2–1 shows vernier setting method and does not reflect the appearance of the vernier on plotting board M16.

2–8. Uses for Plotting Board M16

a. To determine initial azimuth and range (para 2–9*a*).

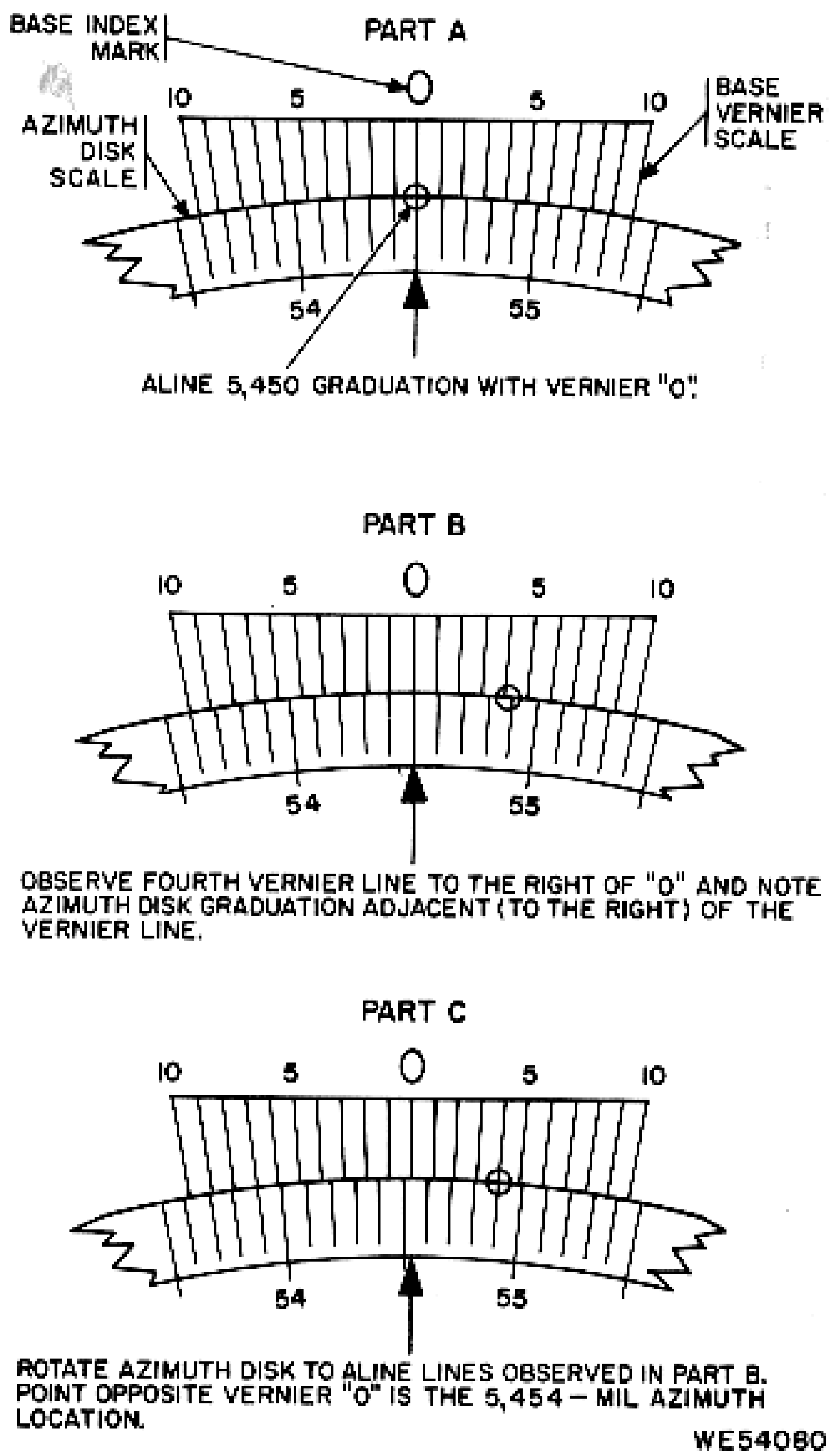


Figure 2–1. Use of the vernier scale.

b. To determine GT (gunner to target) mil values from the azimuth scale on the azimuth disk (para 2–9*b*).

c. To solve problems involving mil relations (para 2–9*c*).

d. To solve survey notes (para 2–9*d*).

2–9. Sample Problems

a. Determination of the Initial Azimuth and Range from the Weapon Firing Position to the Target.

(1) *Problem.* Observation post (OP) at the center (pivot point) of the disk.

OP to weapon: Azimuth 4150 mils
Distance 550 meters

OP to target: Azimuth 5454 mils
Distance 1500 meters

(2) *Procedure.* To determine the azimuth and range from the weapon to the target using the range scale along the index line (fig. 1–3), where the smallest grid graduation represents 50 meters, proceed as indicated in (a) through (d) below.

(a) Rotate the disk until 4150 mils is read over the index mark on the base. Mark the disk with a pencil dot over the index line at the 550-meter graduation. This dot represents the location of the weapon (W).

(b) Rotate the disk until 5454 mils is read over the index mark on the base. Mark the disk with a pencil dot over the index line at the 1500-meter graduation. This dot represents the location of the target (T).

(c) Rotate the disk until the two pencil dots are over, or parallel to, the same vertical line, or are the same distance from the same vertical line, with the dot representing the location of the target (T) toward the vernier scale.

(d) Read the WT azimuth, at the index mark on the base, as 5830 mils. The total number of meters between the pencil dots when in this position (1400 meters above the horizontal OP line passing through the pivot plus 50 meters below) is the weapon-target range (WT), 1450 meters.

b. Determination of GT Mil Values from the Azimuth Scale on the Azimuth Disk.

(1) *Problem 1.* Observation post at center (pivot point) of the disk.

Observer (O) to Target (T):
Azimuth 800 mils
Distance 2500 meters
Observer (O) to Gun (G):
Azimuth 2500 mils
Distance 1250 meters
GT = 348 mils.

(2) *Problem 2.* Observation post at center (pivot point) of the disk.

Observer (O) to Target (T):
Azimuth 5900 mils
Distance 3200 meters
Observer (O) to Gun (G):
Azimuth 3850 mils
Distance 1050 meters
GT = 6159 mils.

(3) *Problem 3.* Observation post at center (pivot point) of the disk.

Observer (O) to Target (T):
Azimuth 2510 mils
Distance 1400 meters
Observer (O) to Gun (G):
Azimuth 1310 mils
Distance 1810 meters
GT = 3702 mils.

c. Resolution of Problems Involving Mil Relations.

(1) *Problem 1.*

(a) *Given:* Observer has plotting board M16 and is adjusting the sheaf of the weapons on the base point. Observer (O) to Base Point: Distance 400 meters. Burst from one weapon: 25 mils to left of its proper place in the sheaf (measured with binocular at OP).

1. Angles involved are less than 30 mils. For ease in reading and increasing accuracy, count each 10-mil graduation of the mil scale as one mil (10/10 = 1). Therefore, count the smallest grid graduation for lateral measurements only as 5 meters (50/10 = 5) when using the range scale along the index line. When the range scale to the left of the index line is used, the smallest grid graduation for range represents 100 meters; therefore, count each lateral grid graduation as 10 meters (100/10 = 10).

2. Angles involved are more than 30 mils. Read the graduations on the mil scale as printed (10 mils each) and count each lateral grid graduation as either 50 or 100 meters, depending on the range scale used. Other types of mil relationship may be similarly obtained.

(b) *Procedure.* To determine the deflection correction meters, using the range scale along the index line (where the smallest grid graduation represents 50 meters), proceed as indicated in 1 and 2 below.

1. Starting with the 0 (zero) on the mil scale at the index mark and with the pivot point of the disk representing the observation post (OP), rotate the disk under 25 mils 250 mils ((a)1 and 2 above) is read over the index mark.

2. From the index line at the 400-meter graduation, measure laterally (perpendicular to the index line) to the black centerline on the disk, counting each small grid graduation as 5 meters ((a)1 and 2 above). Note that this distance measures two small grid graduations or 10 meters. Since the burst was to the left of the OT line, the deflection correction is right 10 meters.

(2) *Problem 2.*

(a) *Given:* Computer in the FDC has plotting board M16 and is controlling the adjustment of the sheaf on the base point. Range Weapon to Base Point: 1700 meters. Observed

correction for one weapon: Right 10 meters ((1) (b) 2 above). Deflection Setting on Weapon: Right 30, base stake.

(b) *Procedure.* To determine the deflection correction to be placed on the sight, proceed as indicated in 1 through 4 below.

1. Set the 0 (zero) on the mil scale at the index mark. With the pivot point of the disk representing the weapon position, locate the 1700-meter graduation (weapon-base point range) on the index line.

2. From the index line at the 1700-meter graduation, measure off laterally (perpendicular and to the left of the index line) two small grid graduations, or 10 meters, and mentally note this point (grid intersection) on the base.

3. Rotate the disk until the black centerline intersects this point (grid intersection) and read the angle at the index mark on the base, in this case 6 mils.

4. As the deflection setting on the sight is right 30, the deflection to be given to the weapon is right 35 (right 30 plus right 6 to the nearest 5-mil graduation).

d. Solving of Survey Notes.

(1) *Given.* The weapon personnel are placed in a position by section, each section in a different location. The first section is plotted at the pivot point of the plotting board. The second section is located (surveyed) with reference to the first section by compass and pacing. A traverse of two legs is made to the second section from the first section.

(a) *First leg:* Azimuth 3800 mils
Distance 400 meters

(b) *Second leg:* Azimuth 4400 mils
Distance 500 meters

(2) *Procedure.* To plot the location of the second section with reference to the first section, proceed as indicated in (a) through (c) below.

(a) Use the range scale along the index line.

(b) Rotate the disk until azimuth 3800 is at the index mark. Count up 400 meters along the red index line and make a pencil dot.

(c) Rotate the disk until azimuth 4400 is at the index mark. From the pencil dot just plotted, count up 500 meters and make a pencil dot. This is the location of the second section.

Note. To determine the azimuth and distance from the first section to the second section, rotate the disk until the plotted location of the second section is toward the top of the plotting board and is on the same vertical line or the same distance from the same vertical line, as the first section plot (in this case on the red index line). The azimuth is 4134 mils and the distance is 861 meters from the observation post (OP).

2–10. Accuracy

a. With one extremity of the dial index line in coincidence with each of the diametrical centerlines of the base, the other extremity of the index line shall not be more than 5 mils out of coincidence with the corresponding base centerline.

b. The plotting board accuracy for the gun to target (GT) line shall be within 5.0 mils as determined by placing pencil dots at the target (T) and gun (G) points as measured from observer (O) (represented by the center pivoting point of the dial) using the OT and OG values specified above. When a line is drawn through the GT dots, the GT line is then laid parallel to the base O centerline (index line, fig. 1–3) and the GT mil value is determined from the mil scale (azimuth scale, fig. 1–4) on the dial.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

2–11. General

In addition to the normal operating procedures for usual conditions described in paragraphs 2–4 through 2–10, special instructions for operating under unusual conditions are contained herein. In addition to the normal preventive-maintenance services, special care in cleaning and handling must be observed where extremes of temperature and atmospheric conditions are present. Proper cleaning and handling not only insure proper operation and functioning, but also guard against breakage and/or deterioration of the materiel.

2–12. Operation in Extreme Cold

a. In temperatures below freezing, it is necessary that extra care be used when handling the plotting board. Extreme cold will make the plastic material of the board more brittle, hence it will be more easily broken if dropped or struck against other objects.

b. Use a dry cloth for cleaning. A water dampened cloth will either freeze to the plotting board or it will leave a film of ice on the board and make it inoperable.

c. Do not permit the accumulation of snow or

ice on the plotting board. When not in use, always keep the plotting board inside carrying case M105 to prevent such accumulation and/or damage or destruction.

d. Never apply heat from strongly concentrated sources directly to an extremely cold plotting board. Sudden great temperature changes may cause breakage of the component parts of the plotting board or it may result in separation of the bonded components due to "breaking-up" of the bond.

2–13. Operation Under Dusty or Sandy Conditions

Under extremely dusty or sandy conditions, extra care must be exercised when cleaning the plotting board so that scratching of the transparent plastic surfaces does not occur. Such scratching will damage the transparent quality of the base grid and azimuth disk surfaces. Excessive scratching willl cause damage and/or destruction of the lines of the vernier and scale and render the plotting board difficult to read and/or useless. Shake all dust and sand from the carrying case.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, TOOLS, AND EQUIPMENT

3–1. General

Repair parts, tools and equipment are issued if necessary to the using organization for operating and maintaining plotting board M16. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stored.

3–2. Repair Parts

Repair parts are supplied to the using organization for replacement of those parts that become worn, broken, or otherwise unserviceable. These repair parts are listed in appendix C, which is the authority for requisitioning replacements.

3–3. Common Tools and Equipment

No standard or commonly used tools and equipment are required or authorized.

3–4. Special Tools and Equipment

No special tools and equipment are required for the plotting board M16.

Section II. PREVENTIVE-MAINTENANCE SERVICES

3–5. General

Preventive-maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational readiness. Operators preventive maintenance is accomplished by the equipment operator. The operator's role in the performance of preventive-maintenance service is:

a. To perform the daily service each day the equipment is operated.

b. To assist the organizational maintenance mechanics in the performance of any other scheduled periodic services specified by pertinent technical manuals.

c. To assist the organizational maintenance mechanics in the lubrication of the equipment in accordance with the pertinent lubrication order.

3–6. Responsibility

Operators and crew chiefs are personally responsible for assigned equipment. Squad, section, and platoon leaders are charged with supervisory responsibility for equipment pertaining to their commands. Unit and organization commanders are required to insure that equipment issued or assigned to their commands is properly maintained in a serviceable condition, and that it is properly cared for and used.

3–7. Recording Repairs

Repairs accomplished will be in accordance with procedures and standards prescribed in appropriate technical manuals. The equipment record system provides for recording repairs required and accomplished on specific items of equipment. This will include, but is not limited to adjusting, cleaning and replacing. Deficiencies discovered before, during and after operation that cannot be corrected by the operator will be entered on DA Form 2404. Deficiencies immediately corrected by the operator are not recorded, except when such corrections are made by replacing parts or which constitute repairs above operators maintenance. Such repairs will be recorded as organizational maintenance.

3–8. General Procedures for All Services and Inspections

a. The following general procedures apply to

operator preventive-maintenance services and all inspections for plotting board M16 and carrying case M105, and are just as important as the specific procedures.

b. Inspections to see if items are in good condition, correctly assembled or stowed, secure, not excessively worn, not leaking, and adequately lubricated apply to most items in the preventive-maintenance and inspection procedures. Any or all of these checks that are pertinent to plotting board M16 and carrying case M105 (including supporting, attaching, or connecting members) will be performed automatically, as general procedures, in addition to any specific procedures given.

(1) Inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond safe or serviceable limits. Good condition is explained further as meaning: not bent or twisted, not chafed or burred, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut, not mildewed or deteriorated.

(2) Inspection of a unit to see that it is "correctly assembled" or stowed is usually a visual inspection to see if the unit is in its normal position in the equipment and if all its parts are present and in their corrective relative position.

(3) Inspection of a unit to see if it is "secure" is usually an external visual examination or a check by hand for looseness. Such an inspection must include the azimuth disk and the range scale arm of plotting board M16 and metal snaps and carrying strap of carrying case M105.

(4) By "excessively worn" is meant worn beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection. It includes illegibility of surface lines on base grid, surface lines and printed matter on range scale arm, and surface digs on base grid. Excessive wear of mating parts is motivated by overuse or improper care. It includes a worn or destroyed base grid pivot point bearing and a bent range scale arm pivot point.

(5) Such expressions as "adjust if necessary" or "replace if necessary" should not be used in the specific procedures. It is understood that whenever inspection reveals the need of adjustment, repairs, or replacement, the necessary action will be taken.

c. General cleaning instructions are as follows:

(1) Use dry-cleaning solvent or mineral spirits paint thinner to clean or wash grease or oil from the metal snap fasteners on carrying case M105.

(2) After the parts are cleaned, wipe dry thoroughly. Apply a light grade of oil to all polished metal surfaces to prevent rusting.

(3) When authorized to install new parts, remove any preservative materials, such as rust-preventive compound, protective grease, etc.; prepare parts as required; and for those parts requiring lubrication, apply a light film of aircraft and instrument grease, MIL–G–23827.

(4) Use lens-cleaning liquid soap to clean plastic disk or grid base surfaces.

(5) After carrying case M105 is cleaned, rinse and dry thoroughly to prevent mildew.

d. General precautions in cleaning are as follows:

(1) Dry-cleaning solvent or mineral spirits paint thinner is flammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. Use only in well-ventilated places.

(2) These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in the case of some individuals, a mild irritation or inflammation.

(3) The use of diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.

(4) The use of dry-cleaning solvent, alcohol, acetone, or other solvents for cleaning the plastic disk or grid base is prohibited.

3–9. Preventive-Maintenance by Operator(s)

a. Purpose. To assure maximum operational readiness, it is necessary that plotting board M16 and carrying case M105 be systematically inspected at intervals every day it is operated, so defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. Any deficiencies discovered that cannot be corrected by the operator, or corrected by replacing parts, will be reported on DA Form 2404.

b. Daily Preventive-Maintenance Service. Each plotting board and carrying case will be inspected each day that it is operated. This service is divided into three parts as indicated in (1) through (3) below.

(1) *Before-operation service.* This is a brief

service to ascertain that the plotting board and carrying case is ready for operation; it is mainly a check to see if conditions affecting the plotting board and carrying case's readiness have changed since the last after-operation service.

(2) *During-operation service.* This service consists of detecting unsatisfactory performance.

(3) *After-operation service.* This is the basic daily service for the plotting board and carrying case. It consists of correcting, insofar as possible, any operating deficiencies. Thus the plotting board and carrying case is prepared to operate upon a moment's notice.

c. Cleaning and Handling Precautions.

(1) *General precautions in cleaning.*

(a) Under no circumstances use gritty erasers on plotting board M16. For wiping, use only lens tissue paper.

(b) To remove finder prints or pencil markings from plastic disk or base grid, wipe with clean cloth, moistened with lens-cleaning liquid soap. Dry carefully by gently rubbing with lens tissue or clean cloth.

Caution: **Do not place plotting board M16 in the direct rays of hot sun, on heated radiators, or on other types of heated equipment to dry. Such treatment will cause damage to the base grid, azimuth disk and/or scale arm.**

(2) *Care in handling.*

(a) Plotting boards are, in general, suitably designed for functional purposes. They will not, however, stand rough handling or abuse. Inaccuracy or malfunctioning will result from mistreatment.

(b) Any plotting board M16 which cannot be adjusted or corrected by the authorized procedure must be brought to the attention of organizational maintenance personnel for necessary repairs. Adjustments other than those expressly authorized will not be performed by the operator.

(c) Keep the plotting board M16 as clean and dry as possible. If a plotting board is wet, dry it carefully before placing it in its carrying case.

(d) If carrying case M105 is wet, air-dry it thoroughly.

(e) When not in use, keep the plotting board in the carrying case to protect it from dirt, dust, moisture, chipping, scratching, and destruction.

(f) Keep the exposed parts of disk and other parts clean and dry to prevent corrosion and scratching of the surface of the plastic.

d. Services. Preventive maintenance services listed in table 3–1 will apply primarily to the operator. However, those services will also apply to organizational, direct and general support, and depot personnel who may have occasion to use, stow, store, package, or ship plotting board M16 and carrying case M105.

Table 3-1. Preventive Maintenance Checks and Services Operator Maintenance Category

Interval and sequence No.			Item to be inspected	Procedure	Paragraph references
Before operation	During operation	After operation			
				USUAL CONDITIONS	
1			Plotting board M16	Clean and keep dry	3-6
2				Clean pivot and pivot points and apply a light film instrument lubricating oil.	2-3*g*
		3		Stow in carrying case M105.	2-3*k*
		4	Carrying case M105	Clean and keep dry.	3-6
		5		Stow flat when plotting board is installed in case.	
				UNUSUAL CONDITIONS—EXTREME COLD	
6			Plotting board M16	Clean with dry cloth (avoid extreme temperature changes).	2-12
		7	Carrying case M105	Clean and keep dry.	3-6
				EXTREME DUSTY OR SANDY CONDITIONS	
	8		Plotting board M16	Clean carefully to avoid scratching	2-13
		9	Carrying case M105	Shake out dust and sand and clean	2-13

3–10. Scope

Troubleshooting is the systematic isolation of inoperable or defective components by means of symptoms and tests.

3–11. Procedure

The troubleshooting procedure described in table 3–2 is one of determining malfunctions, their probable causes, and the necessary corrective actions required to remedy the malfunction. Corrective actions that are beyond the scope of the operator will be taken by the organizational, direct and general support, or depot maintenance personnel.

Table 3–2. Troubleshooting

Malfunction	Probable cause	Corrective action
Base grid bent, surface lines destroyed, or surface has digs.	Excessive use or improper care	Obtain new plotting board.
Base grid pivot point bearing worn, loose, or destroyed.	Excessive use or improper care	Obtain new plotting board.
Azimuth disk bent, broken, surface lines destroyed, or surface has digs.	Excessive use or improper care	Clean and use as far as is practical. Do not use if damage prevents accuracy.[1]
Azimuth disk loose on base grid	Pivot point of base grid oversize	Obtain new plotting board.
	Pivot point of disk undersize	Obtain new plotting board.
	Pivot point in disk and/or base loosened in setting.	Obtain new plotting board.
Azimuth disk tight on base grid	Pivot point in disk and/or base is bent or dented.	Use a steel reamer to remove small dent inside base grid pivot point. Use a fine square stone to remove small dent on disk pivot point.
Range scale arm bent, broken, or surface lines destroyed.	Excessive use, accidental damage, or improper care.	Obtain a new arm in accordance with appendix C.
Range scale arm pivot point bent	Accidental damage or improper care	Obtain a new arm, in accordance with appendix C.
Range scale arm loose on azimuth disk	Pivot point of azimuth disk oversize	Obtain new plotting board.
	Pivot point of arm is undersize	Obtain a new arm in accordance with appendix C.
	Pivot point of arm is loosened in setting.	Obtain a new arm in accordance with appendix C.
Range scale arm tight on azimuth disk	Pivot point of azimuth disk is dented or undersize.	Use a steel reamer to remove dent inside base grid pivot point.[1]
	Pivot point of arm is bent or oversize	Obtain a new arm in accordance with appendix C.
	Pivot point of arm is burred or oversize.	Use a fine, square, stone to hone bur and reduce oversize condition.[2]
Improper alinement of base grid lines, azimuth disk lines, vernier scale, etc.	Excessive use or improper care	Obtain a new plotting board.
	Accidental damage	Obtain a new plotting board.
Improper alinement of range scale arm lines, vernier scale, etc.	Pivot point bent	Obtain a new arm in accordance with appendix C.
	Pivot point of arm is loosened in setting.	Obtain a new arm in accordance with appendix C.
Metal snaps are torn loose, or are missing, from carrying case.	Excessive use or accidental damage	Obtain new carrying case.
Carrying strap is loose or torn from carrying case.	Excessive use or accidental damage	Obtain new carrying case.
Cracked or distorted disk	Improper removal	Remove range scale arm from plotting board. Insert pivot of central knob, affixed to range scale arm, in hole of metallic retainer on rear of base. Push central knob to release azimuth disk.

[1] If accuracy specified in paragraph 2–10 cannot be achieved by this action, obtain a new plotting board M16.
[2] If accuracy specified in paragraph 2–10 cannot be achieved by this action, obtain a new range scale arm.

Section IV. REPAIR OF PLOTTING BOARD M16 AND CARRYING CASE M105

3–12. General

a. Repair of plotting board M16 (fig. 1–2) is authorized.

b. Repair of carrying case M105 (fig. 1–1) is not authorized.

3–13. Maintenance

a. If the range scale arm (fig. 1–5) becomes loose, worn, damaged, or destroyed in such a manner as to render it inaccurate or inadequate for plotting board M16, it should be replaced in accordance with table 3–2 and as authorized in appendix C.

b. If the carrying case M105 (fig. 1–1) becomes worn, damaged, or destroyed in such a manner as to render it an inadequate protection for the plotting board M16, it should be replaced in accordance with table 3–2 and as authorized in appendix C.

CHAPTER 4

FINAL INSPECTION

4–1. General

Final inspection of plotting board M16 and carrying case M105 will consist primarily of a visual inspection of the materiel by organizational, direct and general support, or depot maintenance personnel.

4–2. Good Condition

When it has been determined that the materiel is in good condition (para. 3–8*b*(1)), it shall be stowed or placed into storage.

4–3. Excessively Worn

When it has been determined that the materiel is excessively worn (para. 3–8*b*(4)), it shall be replaced in accordance with appendix C.

CHAPTER 5

PROCESSING AND PACKAGING, SHIPMENT, AND DESTRUCTION TO PREVENT ENEMY USE

Section I. PROCESSING, PACKAGING, AND SHIPMENT

5–1. Processing and Packaging

For instructions for processing and packaging of plotting board M16, carrying case M105, and TM 9-1220-204-14, refer to MIL-P-116.

5–2. Shipping Instructions

When shipping the plotting board M16, carrying case M105, and the technical manual TM 9-1220-204-14, the officer in charge of preparing shipments will be responsible for plotting board M16 being shipped in a serviceable condition, properly packaged, and packed, including the preparation of Army shipping documents.

Section II. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

5–3. General

a. Destruction of plotting board M16 when subject to capture or abandonment in the combat zone will be undertaken by the using arm only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander.

b. The information which follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items of issue to the using organization. The issue of these and related materials and the conditions under which destruction will be effected are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are indicated in (1) through (4).

(1) Mechanical—which requires axe, pick mattock, sledge, crowbar, or similar implement.

(2) Burning—which requires gasoline, oil, incendiary, grenades, and other flammables, or welding or cutting torch.

(3) Demolition—which requires suitable explosives or ammunition and gunfire utilizing artillery, machine guns, rifles with rifle grenades, or launchers using antitank rockets. Under some circumstances, hand grenades may be used.

(4) Disposal—which requires burying in the ground, dumping in streams, or marshes, or scattering so widely as to preclude recovery of essential parts.

Note. These methods are generally applicable only when the plotting board is to be destroyed in conjunction with other equipment.

c. In general, destruction of essential parts followed by burning will usually be sufficient to render the material useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

d. If destruction to prevent enemy use is resorted to, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevent destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel, so that the enemy cannot construct one complete unit from several damaged ones.

e. If destruction by demolition or gunfire is directed, due consideration should be given to the observance of appropriate safety precautions.

5–4. Procedures for Destruction of Plotting Board M16

a. Method No. 1—By Mechanical Means.

(1) Remove the plotting board from its carrying case.

(2) Using an axe, pick mattock, sledge, or similar implement, destroy the plotting board by smashing the base, destroying the base grid surface, azimuth disk and range scale arm. Elapsed time: about 2 minutes.

b. Method No. 2—By Burning.

(1) Remove the plotting board from its carrying case.

(2) Using a welding or cutting torch, burn the base, base grid surface, and azimuth disk. Elapsed time: about 3 minutes.

(3) In the absence of a welding or cutting torch, place the plotting board on a pile of combustible material. Pour gasoline or oil over the combustible material and over the plotting board; ignite and take cover. A hot fire is required to render the material useless. Elapsed time: about 2 minutes.

***Warning:* When igniting gasoline, due consideration shall be given to the highly flammable and explosive nature of gasoline and its vapor. Carelessness in its use may result in painful burns.**

c. Method No. 3—By Disposal. Bury the plotting board in a suitable hole or throw it into a stream. Elapsed time: about 2 minutes.

APPENDIX A

REFERENCES

A–1. Publications Indexes

The following indexes will be consulted frequently for latest changes or revisions of reference given in this appendix and for new publications relating to materiel covered in this technical manual.

Index of Administrative Publications	DA PAM 310–1
Index of Blank Forms	DA PAM 310–2
Index of Supply Catalogs and Supply Manuals	DA PAM 310–6
Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Supply Manuals (Types 7, 8, and 9) and Lubrication Orders	DA PAM 310–4
Index of Training Devices	DA PAM 310–8
Modification Work Orders	DA PAM 310–7

A–2. Forms

DA FORM 9–1	Materiel Inspection Tag
DA FORM 829	Rejection Memorandum
DA FORM 2028	Recommended Changes to DA Publications
DA FORM 2404	Equipment Inspection and Maintenance Worksheet
DA FORM 2407	Maintenance Request
DD FORM 6	Report of Damaged or Improper Shipment
DD FORM 250	Materiel Inspection and Brevity Report

A–3. Other Publications

a. General

Accident Reporting and Records	AR 385–40
Army Equipment Record Procedures	AR 38–750
Authorized Abbreviations and Brevity Codes	AR 310–50
Dictionary of United States Army Terms	AR 310–25

b. Maintenance

Command Maintenance Management Inspection	AR 750–8
General Maintenance Procedures for Fire Control Materiel	TM 9–254
Grease, Aircraft and Instrument (For High and Low Temperature)	MIL–G–23827

c. Shipping and Storage

Logistics (General): Report of Damage or Improper Shipment Markings and Packing of Supplies and Equipment Marking of Supplies and Shipment	AR 700–58
Preservation, Methods of	AR 700–15
Preservation, Packaging and Packing	MIL–P–116

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B–1. General

This Maintenance Allocation Chart designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of field maintenance tasks upon this end item or component will be consistent with the assigned maintenance operations.

B–2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine serviceability of an item by comparing its physical, mechanical and electrical characteristics with established standards.

b. Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

c. Service. To clean, to preserve, to charge and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

d. Adjust. To rectify to the extent necessary to bring into proper operating range.

e. Align. To adjust specified variable elements of an item to bring to optimum performance.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

g. Install. To set up for use in an operational environment such as an emplacement, site, or vehicle.

h. Replace. To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

i. Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

j. Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

k. Rebuild. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

l. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

B–3. Explanation of Columns

Listed below is an explanation of the columns shown in the maintenance allocation chart:

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, Functional Group. Column 2 lists the noun names of components, assemblies, sub-

assemblies and modules on which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the lowest level at which that particular maintenance function is to be performed.

d. Column 4, Tools and Equipment. This column shall be used to specify, by code, those tools and test equipment required to perform the designated function.

e. Column 5, Remarks. Self-explanatory.

Nomenclature of End Item or Component

PLOTTING BOARD M16

SECTION II—MAINTENANCE ASSIGNMENT

Group Number (1)	Functional Group (2)	Maintenance Function (3)											Tools and Equipment (4)	Remarks (5)
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
1.	INDIRECT FIRE, PLOTTING BOARD M16	C	--	C	--	--	--	--	O	O	--	--	N/A	None
2.	CARRYING CASE M105	C	--	C	--	--	--	--	O	--	--	--	N/A	None

APPENDIX C

BASIC ISSUE ITEMS LIST, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

This manual is current as of 24 May 1971

Section I. INTRODUCTION

C–1. Scope

This appendix is a list of repair parts and special tools and equipment for the performance of Operator, Organizational, Direct Support, General Support and Depot Maintenance for Plotting Board M16.

C–2. General

This Repair Parts and Special Tools List is divided into the following sections.

a. Basic Issue Items List—Section II. A list of items which accompany the plotting board M16 and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies—Section III.

Not applicable.

c. Prescribed Load Allowance (PLA)—Section IV.

A composite listing of the repair parts, special tools, test and support equipment having quantitative allowances for initial stockage at the organizational level.

d. Repair Parts for Organizational Maintenance—Section V.

A list of repair parts authorized for the performance of maintenance at the organizational level in figure and item number sequence.

e. Special Tools, Test and Support Equipment for Organizational Maintenance—Section VI.

A list of special tools, test and support equipment authorized for the performance of maintenance at the organizational level.

f. Repair Parts for Direct Support, General Support and Depot Maintenance—Section VII. A list of repair parts authorized for the performance of maintenance at the direct support, general support, and Depot level in figure and item number sequence.

g. Special Tools, Test and Support Equipment for Direct Support, General Support, and Depot Maintenance—Section VIII. A list of special Tools, Test and Support Equipment authorized for the performance of maintenance at the direct support, general support, and depot level.

h. Federal Stock Number and Reference Index—Section IX. A list of Federal stock numbers in ascending numerical sequence followed by a list of reference numbers in ascending alphanumeric sequence, cross referenced to the illustration figure number and item number.

C–3. Explanation of Columns

The following provides an explanation of columns in the tabular list in Sections II through VIII.

a. Source Maintenance and Recoverability Code (SMR)

(1) Source code, indicates the selection status and source for the listed item. Source codes are:

Code	*Explanation*
P	Repair Parts, Special Tools, and Test Equipment supplied from the GSA/DSA, or Army supply system, and authorized for use at indicated maintenance categories.
P2	Repair Parts, Special Tools, and Test Equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
P9	Assigned to items which are NSA design controlled: Unique repair parts, special tools, test, measuring and diagnostic equipment, which are stocked and supplied by the Army COMSEC Logistic System and which are not subject to the provisions of AR 380–41.

Code	Explanation
P10	Assigned to items which are NSA design controlled: Special tools, test, measuring and diagnostic equipment for COMSEC support, which are accountable under the provisions of AR 380–41, and which are stocked and supplied by the Army COMSEC Logistic System.
M	Repair Parts, Special Tools, and Test Equipment which are not procured or stocked, as such, in the supply system but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies that are not procured or stocked because the failure rate is normally below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair Parts which are not procured or stocked. The requirement for such items will be filled by the next higher assembly or component.
X2	Repair Parts, Special Tools, and Test Equipment which are not stocked and have no foreseen mortality. The indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage, if not obtainable through cannibalization or salvage, the item may be requisitioned with exception data, from the end item manager, for immediate use.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above the DS and GS level or returned to depot supply level.

Note: Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded X1 and aircraft support items as restricted by AR 700–42.

(2) Maintenance Code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level codes are:

Code	Explanation
C	Operator/crew
O	Organizational maintenance
F	Direct support maintenance
G	General support maintenance
D	Depot maintenance

(3) Recoverability Code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applies to repair parts (assemblies and components) special tools and test equipment which are considered economically repairable at direct and general support maintenance levels. When the item is no longer economically repairable, it is normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710–50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts, special tools, test equipment, and assemblies which are economically repairable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically repairable, they will be evacuated to a depot for evaluation and analysis before final disposition.
T	Higher dollar value recoverable repair parts, special tools, and test equipment which are subject to special handling and are issued on an exchange basis. Such items will be evacuated to the depot for overhaul or final disposition. Communications-Electronics and Missile Support Items will be repaired/overhauled only at depots.
U	Repair parts, special tools, and test equipment specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value, or reusable casings or castings.

Note: When no code is indicated in the recoverability column, the part will be considered nonrecoverable.

b. Federal Stock Number Column. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description Column. This column indicates the Federal item name and any additional description of the item required. The abbreviation "W/E", when used as a part of the nomenclature, indicates the Federal stock number includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit. This column indicates the quantity of the item used in the assembly or the portion illustrated. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g., shims, spacers, etc.).

f. Quantity Furnished with Equipment. This column indicates the quantity of an item furnished with the equipment.

g. 15-Day Organizational Maintenance Allowance.

(1) The allowance columns are divided into four sub-columns. Indicated in each sub-column opposite the first appearance of each item is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have the letters "REF" in the allowance columns. Items authorized for use as required but not for initial stockage are identified with an asterisk in the allowance column.

(2) The quantitative allowances for organizational level of maintenance represents one initial prescribed load for a 15-day period for the number of equipments supported. Units and organizations authorized additional prescribed loads will multiply the number of prescribed loads authorized by the quantity of repair parts reflected in the density column applicable to the number of items supported to obtain the total quantity of repair parts authorized.

(3) Organizational units providing maintenance for more than 100 of these equipments shall determine the total quantity of parts required by converting the equipment quantity to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51–100 Allowance Column. Example, authorized allowance for 51–100 equipment is 40; for 150 equipments multiply 40 × 1.50 or 60 parts required.

(4) Subsequent changes to allowances will be limited as follows. No change in the range of items is authorized. If additional items are considered necessary, recommendations should be forwarded to Commanding Officer, Frankford Arsenal, ATTN: AMSWE–SMF–W3100, Philadelphia, Pennsylvania 19137, for exception or revision to the allowance list. Revisions to the range of items authorized will be made by the Commanding Officer, Frankford Arsenal, ATTN: AMSWE–SMF–W3100, Philadelphia, Pennsylvania 19137, based upon engineering experience, demand data, or TAERS information.

h. 30-Day DS/GS Maintenance Allowances.

Note. Allowances in GS Column are for GS maintenance only.

(1) The allowance columns are divided into three subcolumns. Indicated in each subcolumn, opposite the first appearance of each item, is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have the letters "REF" in the applicable allowance column. Items authorized for use as required but not for initial stockage are identified with an asterisk in the allowance column.

(2) The quantitative allowances for DS/GS levels of maintenance will represent initial stockage for a 30-day period for the number of equipment supported.

(3) Determination of the total quantity of parts required for maintenance of more than 100 of these equipments can be accomplished by converting the equipment quantity to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51–100 allowance column. Example, authorized allowance for 51–100 equipments is 40; for 150 equipments multiply 40 by 1.50 or 60 parts required.

i. 1-Year Allowance Per 100 Equipments/Contingency Planning Purposes. This column indicates opposite the first appearance of each item the total quantity required for distribution and contingency planning purposes. The range of items indicates total quantities of all authorized items required to provide for adequate support of 100 equipments for one year.

j. Depot Maintenance Allowance Per 100 Equipments. This column indicates opposite the first appearance of each item, the total quantity authorized for depot maintenance of 100 equipments. Subsequent appearances of the same item will have the letters "REF" in the allowance column. Items authorized for use as required but not for initial stockage are identified with an asterisk in the allowance columns.

k. Illustration Column. This column is divided as follows:

(1) Figure number column. Indicates the figure number of the illustration in which the item is shown.

(2) Item number column. Indicates the callout number used to reference the item in the illustration.

C–4. Special Information

Action change codes indicated in the left hand margin of the listing page denote the following.

N—Indicates an added item not included in previous publications.
C—Indicates a change in data.
F—Indicates a change in FSN only.

C–5. How to Locate Repair Parts

a. When Federal stock number or reference number is unknown.

(1) *First.* Using the table of contents, determine the assembly group to which the repair parts belong.

(2) *Second.* Find the illustration covering the assembly group to which the repair part belongs.

(3) *Third.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing, find the assembly group to which the repair part belongs and locate the illustration figure and item number noted on the illustration.

b. When Federal stock number or reference number is known.

(1) *First.* Using the index of Federal Stock Numbers and Reference Numbers find the pertinent Federal stock number or reference number. This index is in ascending FSN sequence followed by a list of reference numbers in ascending alphanumeric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* Using the Repair Parts Listing, find the assembly group of the repair part and the illustration figure number and item number referenced in the index of Federal Stock Numbers and Reference Numbers.

C–6. Abbreviations

Abbreviation	*Explanation*
W/E	With equipment

C–7. Federal Supply Codes for Manufacturers

Code	*Manufacturer*
19200	Frankford Arsenal Phila., Pa. 19137

Section II. BASIC ISSUE ITEMS LIST

(1) SMR code (a) Source	(b) Maint	(c) Recvr	(2) Federal stock No.	(3) Description — Reference Number & Mfr. Code / Usable on Code	(4) Unit of meas	(5) Qty inc in unit	(6) Qty furn with equip	(7) Illustration (a) Fig. No.	(b) Item No.
C P	O		1220-602-7941	INDIRECT FIRE, PLOTTING BOARD, M16 W/E 8270830	EA			1-1	
C X1				INDIRECT FIRE, PLOTTING BOARD, M16 7688931 (19200) EQUIPMENT		1	1		
C P	C		1220-618-8532	CASE, CARRYING, M105 7680317 (19200)	EA	1	1	1-1	5

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Component application	(2) Federal stock number	(3) Description	(4) Qty required for initial operation	(5) Qty required for 8 hours operation	(6) Notes
		NOT APPLICABLE			

Section IV. PRESCRIBED LOAD ALLOWANCE LIST

(1) Federal stock No.	(2) Description — Usable on Code	(3) 15-Day organizational maint allowance (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100
1220-613-8582	CASE, CARRYING M105	*	*	*	1
1220-613-8583	ARM	*	*	1	1
1220-756-8757	DISC	*	*	1	1

Section V. REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE

Act on code	(1) SMR code (a) Source	(b) Maint	(c) Recov	(2) Federal stock No.	(3) Description — *Reference Number & Mfr Code Usable on Code*	(4) Unit of meas	(5) Qty inc in unit	(6) 15-Day organizational maintenance alw (a) 1–5	(b) 6–20	(c) 21–50	(d) 51–100	(7) Illustration (a) Fig. No.	(b) Item No.
C	P	O		1220-618-8588	ARM 7681485 (19200)	EA	1	*	*	1	1	1-1	2
N	P	O		1220-756-8757	DISC 7683933 (19200)	EA	1	*	*	1	1	1-1	3
N	X1	—			BASE 7632523 (19200)		1					1-1	4

Section VI. SPECIAL TOOLS, TEST AND SUPPORT EQUIPMENT FOR ORGANIZATIONAL MAINTENANCE

Act on code	(1) SMR code (a) Source	(b) Maint	(c) Recov	(2) Federal stock No.	(3) Description *Reference Number & Mfr Code Usable on Code*	(4) Unit of meas	(5) Qty inc in unit	(6) 15-Day organizational maintenance alw (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(7) Illustration (a) Fig. No.	(b) Item No.
					EQUIPMENT								
C	P	-C-		1220-613-8532	CASE, CARRYING, M105 7680317 (19200)	EA	1	*	*	*	1	1-1	5

Section VII. REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT and DEPOT MAINTENANCE

Act on code	(1) SMR code (a) Source (b) Maint (c) Recov	(2) Federal stock No.	(3) Description — *Reference Number & Mfr Code* — *Usable on Code*	(4) Unit of meas	(5) Qty inc in unit	(6) 30-Day DS maint allowance (a) 1-20	(6) (b) 21-50	(6) (c) 51-100	(7) 30-Day GS maint allowance (a) 1-20	(7) (b) 21-50	(7) (c) 51-100	(8) 1-Yr alw per 100 equip cntgcy	(9) Depot maint alw per 100 equip	(10) Illustration (a) Fig. No.	(10) (b) Item No.
C	P -O-	1220-618-8533	ARM 7681435 (19200)	EA	1	1	1	2	1	1	2	24	10	1-1	2
C	P -O-	1220-756-3757	DISC 7633933 (19200)	EA	1	1	1	2	1	1	2	24	10	1-1	3
N	X1--		BASE 7632523 (19200)		1									1-1	4

Section VIII. SPECIAL TOOLS, TEST AND SUPPORT EQUIPMENT FOR DIRECT SUPPORT, GENERAL SUPPORT and DEPOT MAINTENANCE

Act on code	(1) SMR code (a) Source	(b) Maint	(c) Recov	(2) Federal stock No.	(3) Description *Reference Number & Mfr Code* / *Usable on Code*	(4) Unit of meas	(5) Qty inc in unit	(6) 30-Day DS maint allowance (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-Day GS maint allowance (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-Yr alw per 100 equip cntgcy	(9) Depot maint alw per 100 equip	(10) Illustration (a) Fig. No.	(b) Item No.
					EQUIPMENT												
C	P	C		1220-613-8532	CASE, CARRYING, M105 7680317 (19200)	EA	1	*	1	1	*	1	1	12		1-1	5

Section IX. INDEX—FEDERAL STOCK NUMBER AND REFERENCE NUMBER CROSS-REFERENCED TO FIGURE AND ITEM NUMBER

Stock Number	Figure No.	Item No.
1220-602-7941	1-1	--
1220-613-8532	1-1	5
1220-613-8533	1-1	2
1220-756-3757	1-1	3

Reference No.	Mfr code	Figure No.	Item No.
7633931	19200	1-1	1
7632523	19200	1-1	4
7633933	19200	1-1	3
7680317	19200	1-1	5
7681435	19200	1-1	2
8270330	19200	1-1	--

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